

ANNUAL CSO REPORT

1987/1988

METRO
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CSO CONTROL PROGRAM IMPLEMENTATION

In 1988 the Metro Council adopted a comprehensive CSO control plan for the Metro system. This plan which was subsequently approved by DOE, calls for a 75 percent CSO volume reduction from baseline conditions over the next 20-year period. Ten separate CSO control projects were identified within the plan as was a proposed schedule for their implementation. That schedule is as follows:

| <u>Project</u> | <u>Year of Design Initiation</u> | <u>Year On-Line</u> |
|---|--|-------------------------|
| Hanford/Bayview/Lander | 1986 | 1992 |
| CATAD Modifications | 1987 | 1991 |
| Parallel Fort Lawton Tunnel | 1987 | 1993 |
| Carkeek Transfer/CSO Treatment Facility | 1988 | 1992 |
| University Regulator (Green Lake/Portage Bay Water Quality Project) | 1986 | 1992 |
| Alki Transfer/CSO Treatment Facility | 1989 | 1995 |
| Denny Partial Separation | 1993 | 1999 |
| Diagonal Total Separation | 1995 | 1999 |
| Michigan Total Separation | 1997 | 2003 |
| Kingdome Total Separation | 2000 | 2006 |

Recognizing the need to fine tune the proposed project schedule to maximize opportunities to achieve a 75 percent CSO volume reduction, the plan as adopted requires a routine reevaluation of projects and schedules at a minimum of five-year intervals.

STATUS OF CURRENT CSO CONTROL PROJECTS

CSO abatement projects undertaken in 1988 and planned for 1989 are summarized as follows:

Hanford/Bayview/Lander

Scope

This plan consist of a partial separation of the Lander and Hanford basins and was the most cost-effective CSO control alternative investigated for the basins.

Hanford: The Hanford separation project was on-line in October 1987. The project involved the installation of a new 36-inch sanitary sewer inside an existing 108-inch tunnel that was used to convey combined flows from Rainier Valley to the Elliott Bay Interceptor. The 36-inch line is used to convey partially separated flow to the Elliott Bay Interceptor and the 108-inch tunnel is used to convey storm water to the Diagonal Way storm drain and then to the Duwamish River. The project partially separated about 1,132 combined acres upstream of the tunnel and eliminated CSOs from the Hanford No. 1 Regulator.

Lander/Bayview: The Lander Separation Project consists of two phases the first of which is currently under way. Phase 1 provides partial separation of the Lander basin through the installation of a new 96-inch sanitary trunk line to convey flows from the existing combined collection system to the Elliott Bay Interceptor. The existing 84-inch line will be used for storm water. The new 96-inch line will provide about 1.4 million gallons of storage capacity. The project also requires the installation of a new storm water collection system in the basin that will ultimately be owned and operated by the City of Seattle. The Bayview Tunnel will be used to divert flows from the Hanford Basin to the Lander sanitary trunk line. The components of Phase 1 and 2 are as follows:

Phase 1:

- o 96-inch Lander sanitary trunk
- o New Lander regulator
- o Elliott Bay Interceptor connection
- o Bayview diversion structure
- o New storm water collection system from existing 84-inch Lander trunk to the limits of the Lander Street right-of-way
- o Connection of existing combined collection system to new 96-inch sanitary trunk through drop manhole structures

Phase 2:

- o New storm water collection pipeline in Lander Basin
- o Connect existing street drainage and parking lots to new storm water collection pipelines within right-of-way limits

Status

The following schedule depicts tasks for 1987 through 1991.

| 1987 | 1988 | 1989 | 1990 | 1991 |
|------|-------|----------------------|-----------------------|-----------------------|
| | ----- | Consultant Selection | | |
| | | ---- | Predesign | |
| | | ----- | Final Design Phase 1 | |
| | | | -- | Permits, Phase 1 |
| | | | -- | Bid/Award, Phase 1 |
| | | | ----- | Construction, Phase 1 |
| | | ----- | Final Design, Phase 2 | |
| | | | --- | Permits, Phase 2 |
| | | | -- | Bid/Award, Phase 2 |
| | | | ----- | Construction, Phase 2 |

Consultant selection, predesign and final design of Phase 1 occurred in 1988. Final design will be complete and construction will begin in 1989. Final design of Phase 2 will be complete by the end of 1989.

CATAD Modifications

Scope

Modifications to the CATAD control system will improve the system's efficiency by more fully utilizing the storage capacity in existing sewers.

The previous computer control system took advantage of 17 to 28 million gallons or 28 to 47 percent of the storage within the system's estimated 60 million gallons. Planning level estimates anticipate the improvements will increase the capture rate to 73 percent or about 44 million gallons and reduce CSO volumes in the West Point service area by about 175 million gallons from the estimated total 2.4 billion gallons.

Status

The project consists of two elements: software development/testing and flow sensors installation. The schedule for implementation is as follows:

| | 1986 | 1987 | 1988 | 1989 | 1990 |
|-----------------------------------|------|------|------|-------|------|
| Software Development & Testing | | | | ----- | |
| Flow Sensors | | | | ----- | |

Development of adaptive control software will improve the use of collection system pipe storage for reducing combined sewer overflows in the West Point collection system. Hydraulic and hydrological models were complete in 1987. Forecast programs will be complete by the end of 1988. Control strategies, adaptive control development, and the testing of adaptive control are scheduled to be complete by the end of 1989. Control strategies tuning is scheduled to occur in fall 1989.

Selection, purchase and installation of new flow sensors in the collection system will provide more accurate calibration of software and improvement of storage control. The flow sensors will be installed in early 1989.

Parallel Fort Lawton Tunnel

Scope

The new parallel tunnel will accommodate an additional capacity of 82 mgd for combined sewer flows over the secondary base flow capacity of 358 mgd. The combined sewer flows will receive treatment at West Point. This project will provide CSO relief in the Ship Canal, especially the Ballard regulator and Third Ave. West weir.

Status

The project schedule through completion of construction is as follows:

| 1987 | 1988 | 1989 | 1990 | 1991 | |
|------|-------|-----------|--------------|-----------------|--------------|
| | ----- | Predesign | | | |
| | | ----- | Final Design | | |
| | | | --- | Project Permits | |
| | | | ----- | Bid & Award | |
| | | | | ----- | Construction |

Pre-design was completed in 1988. Tasks for 1989 include final design, obtaining project permits and construction.

Carkeek Transfer/CSO Treatment Facility

Scope

The Carkeek project is designed to transfer 2.25 times AWWF flows from the Carkeek drainage basin to the West Point plant where they will receive secondary treatment. Flows above this will receive treatment and disinfection at the existing Carkeek treatment plant. The present facilities will undergo minor modifications to enable the intermittent treatment of peak storm related flows. Specific permit conditions for operation of the Carkeek stormweather plant will be negotiated with DOE.

Status

The project schedule from consultant selection through start-up is as follows:

| 1987 | 1988 | 1989 | 1990 | 1991 | 1992 | 1993 |
|------------------------------------|------|------|------|------|------|------|
| ----- Consultant Selection | | | | | | |
| ----- Predesign/Design Development | | | | | | |
| ----- Final Design | | | | | | |
| ----- Construction | | | | | | |
| -----Start-up | | | | | | |

Consultant selection was completed in early 1988 and predesign/design development is scheduled to be complete in December 1988. Final design will occur through 1989 and will be complete in early 1990.

University Regulator (Green Lake/Portage Bay Water Quality Project)

Scope

Storm runoff from the Densmore drain, Interstate-5, Ravenna Park, and outflow from Green Lake will be diverted from the North Interceptor system to a new storm drain. The results of this project will be a reduction of CSOs into Portage Bay and ultimately to the Ship Canal-Lake Union system by an estimated 150 million gallons annually.

Status

The project schedule is briefly summarized below.

| 1987 | 1988 | 1989 | 1990 | 1991 | 1992 | 1993 | 1994 | 1995 |
|------|------|------|------|------|------|------|------|------|
|------|------|------|------|------|------|------|------|------|

----- Predesign

----- Final Design

----- Construction

Predesign occurred through 1988 and will be complete in June 1989.
Final design will occur from June 1989 through August 1990.

Alki Transfer/CSO Treatment Facility

Scope

The Alki project is designed to transfer 2.25 x AWWF flows from the Alki drainage basin to the West Point plant where it will receive secondary treatment. Flows above this level and up to a maximum of 74 mgd will receive treatment and disinfection at the existing facility which will be modified to permit intermittent operation. Specific permit conditions for operation of the Alki stormweather plant will be negotiated with DOE.

Status

The project schedule from project scope development through construction completion is as follows:

| 1988 | 1989 | 1990 | 1991 | 1992 | 1993 | 1994 |
|------|------|------|------|------|------|------|
|------|------|------|------|------|------|------|

-- Project Scope Development-Physical-Chemical Testing

----- Consultant Selection

----- Predesign

----- EIS Process

----- Design Development

----- Final Design

----- Permit Process

----- Transfer System Constr.

----- Storm Weather
Construction

Consultant selection is scheduled to be complete by the end of 1988 and predesign is scheduled to begin in 1989.

Denny Partial Separation

A portion of the Denny Partial Separation project is being accelerated to coincide with a City of Seattle's waterfront improvement project. A new line will be installed generally between Lenora Street and Broad Street in cooperation with the City's roadway and storm drain work. Alternatives planning and analysis for this portion of the project will occur from December 1988 through March 1989. Construction will most likely begin the third quarter of 1990. Predesign for the remaining portion of the project will begin in 1993. The project schedule is as follows:

| 1988 | 1989 | 1990 | 1991 | 1992 | 1993 | 1998 |
|-----------------------------|------|------|------|-------------------|-----------------|----------------------------|
| ----- Planning and Analysis | | | | | | |
| | | | | -----Construction | | |
| | | | | | ----- Predesign | |
| | | | | | | ---- Project Completion |

Other CSO Abatement Projects

Work on the remaining CSO projects, the Diagonal, Michigan and Kingdome separation projects is not anticipated until after 1993 based on current scheduling.

1987/1988 CSO SAMPLING PROGRAM

Attached to this section are the results from the 1987/1988 discharge sampling efforts.

The CSO quality sampling program established by the 1988 CSO plan required sample collection four times a year from the Ballard Siphon (W003), Third Ave. West (W008), Denny Lake Union (W027), Lander (W030), and S. Michigan (W039) CSOs.

Due to exceptionally dry weather conditions, samples were collected only twice during the report period. These samples were collected in January and late March/early April 1988. It should also be noted, the East Ballard site (W004) was mistakenly sampled instead of the Ballard siphon (W003), so East Ballard data are given in place of Ballard Siphon data.

Blanks indicate the parameter was not analyzed. Zeros indicate the compound or element was below the detection limit, or the concentration was corrected for blank contribution and the blank contribution was greater than or equal to the sample value.

With the return of normal weather patterns in 1988/1989, we anticipate all required quality sampling requirements will be met.

CSO Discharge Quality Data, 1988

| Station NPDES Serial Number | Michigan W039 | Lander W030 | Denny W027 | Third West W008 | East Ballard W004 |
|--------------------------------|------------------|----------------|---------------|--------------------|----------------------|
|--------------------------------|------------------|----------------|---------------|--------------------|----------------------|

PRIORITY POLLUTANT ORGANICS (UG/L)

ACIDS

| | | | | | |
|--------------------------|------|------|----|-----|---|
| Phenol | 0 | 3.2 | 4 | 2.3 | 0 |
| 2-Chlorophenol | 0 | 0 | 0 | 0 | 0 |
| 2-Methylphenol | 0 | 0 | 0 | 0 | 0 |
| 4-Methylphenol | 0 | 0 | 0 | 0 | 0 |
| 2-Nitrophenol | 0 | 0 | 0 | 0 | 0 |
| 2-4-Dimethylphenol | 0.64 | 0 | 0 | 0 | 0 |
| Benzoic Acid | 0 | 0 | 37 | 22 | 0 |
| 2-4-Dichlorophenol | 0 | 0 | 0 | 0 | 0 |
| 4-Chloro-3-Methyl Phenol | 0 | 0.71 | 0 | 0 | 0 |
| 2-4-6-Trichlorophenol | 0 | 0 | 0 | 0 | 0 |
| 2-4-5-Trichlorophenol | 0 | 0 | 0 | 0 | 0 |
| 2-4-Dinitrophenol | 0 | 0 | 0 | 0 | 0 |
| 4-Nitrophenol | 0 | 0 | 0 | 0 | 0 |
| 4-6-Dinitro-O-Cresol | 0 | 0 | 0 | 0 | 0 |
| Pentachlorophenol | 0 | 0 | 0 | 0 | 0 |

BASES

| | | | | | |
|---------------------------|---|---|---|---|---|
| Aniline | 0 | 0 | 0 | 0 | 0 |
| N-Nitrosodi-N-Propylamine | 0 | 0 | 0 | 0 | 0 |
| 4-Chloroaniline | 0 | 0 | 0 | 0 | 0 |
| Nitrosodiphenylamine | 0 | 0 | 0 | 0 | 0 |
| N-Nitrosodimethylamine | 0 | 0 | 0 | 0 | 0 |
| 2-Nitroaniline | 0 | 0 | 0 | 0 | 0 |
| 3-Nitroaniline | 0 | 0 | 0 | 0 | 0 |
| 4-Nitroaniline | 0 | 0 | 0 | 0 | 0 |
| Benzidine | 0 | 0 | 0 | 0 | 0 |
| 3,3-Dichlorobenzidine | 0 | 0 | 0 | 0 | 0 |

NEUTRALS

| | | | | | |
|-------------------------|---|---|---|---|---|
| Bis(2-Chloroethyl)Ether | 0 | 0 | 0 | 0 | 0 |
| 1,3-Dichlorobenzene | 0 | 0 | 0 | 0 | 0 |
| 1,4-Dichlorobenzene | 0 | 0 | 0 | 0 | 0 |

| | | | | | |
|------------------------------|-----|------|-----|------|------|
| Benzyl Alcohol | 0 | 0 | 7.6 | 2.8 | 0 |
| 1,2-Dichlorobenzene | 0 | 0 | 6.6 | 0 | 0.69 |
| Bis(2-Chloroisopropyl)Ether | 0 | 0 | 0 | 0 | 0 |
| Hexachloroethane | 0 | 0 | 0 | 0 | 0 |
| Nitrobenzene | 0 | 0 | 0 | 0 | 0 |
| Isophorone | 0 | 0 | 0 | 0 | 0 |
| Bis(2-Dichloroethoxy)Methane | 0 | 0 | 0 | 0 | 0 |
| 1,2,4-Trichlorobenzene | 0 | 0 | 0 | 0 | 0 |
| Hexachlorobutadiene | 0 | 0 | 0 | 0 | 0 |
| 2-Methylnaphthalene | 1.7 | 3.6 | 1.2 | 0.72 | 0 |
| Hexachlorocyclopentadiene | 0 | 0 | 0 | 0 | 0 |
| 2-Chloronaphthalene | 0 | 0 | 0 | 0 | 0 |
| 2-6-Dinitrotoluene | 0 | 0 | 0 | 0 | 0 |
| Dibenzofuran | 0 | 0.37 | 0 | 0 | 0 |
| 2-4-Dinitrotoluene | 0 | 0 | 0 | 0 | 0 |
| 4-Chlorophenyl Phenyl Ether | 0 | 0 | 0 | 0 | 0 |
| Azobenzene | 0 | 0 | 0 | 0 | 0 |
| 4-Bromophenyl Phenyl Ether | 0 | 0 | 0 | 0 | 0 |
| Hexachlorobenzene | 0 | 0 | 0 | 0 | 0 |

Phthalate Esters

| | | | | | |
|------------------------------|-------|------|------|------|------|
| Dimethyl phthalate | 0 | 0 | 0 | 0 | 0 |
| Diethyl phthalate | 0.42 | 0.42 | 2.8 | 1.9 | 0 |
| Di-n-butyl phthalate | 0 | 0 | 0 | 0 | 0 |
| Butyl benzyl phthalate | 1.4 | 1.1 | 1.3 | 1.4 | 0.58 |
| Di-n-octyl phthalate | 2.2 | 0 | 0 | 0 | 0 |
| Bis (2-ethylhexyl) phthalate | 18 | 6.3 | 15 | 7 | 0 |
| Sum of Phthalate Esters | 22.02 | 7.82 | 19.1 | 10.3 | 0.58 |

Low Molecular Weight PAH

| | | | | | |
|----------------|------|------|------|------|-----|
| Naphthalene | 0.71 | 1.2 | 2.1 | 0.94 | 0 |
| Acenaphthylene | 0 | 0 | 0 | 0 | 0 |
| Acenaphthene | 0 | 0.22 | 0 | 0 | 0 |
| Fluorene | 0.48 | 0.58 | 0 | 0 | 0 |
| Phenanthrene | 1.9 | 1.4 | 0.32 | 0.24 | 0.2 |
| Anthracene | 0 | 0 | 0 | 0 | 0 |
| Sum of LMW-PAH | 3.09 | 3.4 | 2.42 | 1.18 | 0.2 |

High Molecular Weight PAH

| | | | | | |
|--------------------------|------|------|---|---|------|
| Fluoranthene | 2.3 | 1.2 | 0 | 0 | 0.34 |
| Pyrene | 1.9 | 1 | 0 | 0 | 0.23 |
| Chrysene | 1.4 | 0.61 | 0 | 0 | 0 |
| Benzo (a) anthracene | 0.77 | 0 | 0 | 0 | 0 |
| Benzo (b) fluoranthene | 0 | 0 | 0 | 0 | 0 |
| Benzo (k) fluoranthene | 0 | 0 | 0 | 0 | 0 |
| Benzo (a) pyrene | 0 | 0 | 0 | 0 | 0 |
| Dibenzo (a-h) anthracene | 0 | 0 | 0 | 0 | 0 |

| | | | | | |
|---------------------------|------|------|---|---|------|
| Indeno (1,2,3,c-d) pyrene | 0 | 0 | 0 | 0 | 0 |
| Benzo (g,h,i) perylene | 0 | 0 | 0 | 0 | 0 |
| Sum of HMW-PAH | 6.37 | 2.81 | 0 | 0 | 0.57 |

PCBS AND PESTICIDES

PCB

| | | | | | |
|--------------|---|---|---|---|-----|
| Aroclor 1016 | 0 | 0 | 0 | 0 | 0 |
| Aroclor 1221 | 0 | 0 | 0 | 0 | 0 |
| Aroclor 1232 | 0 | 0 | 0 | 0 | 0 |
| Aroclor 1242 | 0 | 0 | 0 | 0 | 0 |
| Aroclor 1248 | 0 | 0 | 0 | 0 | 0 |
| Aroclor 1254 | 0 | 0 | 0 | 0 | 1.6 |
| Aroclor 1260 | 0 | 0 | 0 | 0 | 1.6 |
| Sum of PCBs | 0 | 0 | 0 | 0 | 3.2 |

Pesticides

| | | | | | |
|--------------------|---|---|---|---|---|
| A-BHC | 0 | 0 | 0 | 0 | 0 |
| B-BHC | 0 | 0 | 0 | 0 | 0 |
| D-BHC | 0 | 0 | 0 | 0 | 0 |
| G-BHC | 0 | 0 | 0 | 0 | 0 |
| Heptachlor | 0 | 0 | 0 | 0 | 0 |
| Aldrin | 0 | 0 | 0 | 0 | 0 |
| Heptachlor Epoxide | 0 | 0 | 0 | 0 | 0 |
| A-Endosulfan | 0 | 0 | 0 | 0 | 0 |
| Dieldrin | 0 | 0 | 0 | 0 | 0 |
| 4-4-DDE | 0 | 0 | 0 | 0 | 0 |
| Endrin | 0 | 0 | 0 | 0 | 0 |
| B-Endosulfan | 0 | 0 | 0 | 0 | 0 |
| 4-4-DDD | 0 | 0 | 0 | 0 | 0 |
| Endrin Aldehyde | 0 | 0 | 0 | 0 | 0 |
| Endosulfan Sulfate | 0 | 0 | 0 | 0 | 0 |
| 4-4-DDT | 0 | 0 | 0 | 0 | 0 |
| Chlordane | 0 | 0 | 0 | 0 | 0 |
| Methoxychlor | 0 | 0 | 0 | 0 | 0 |
| Toxaphene | 0 | 0 | 0 | 0 | 0 |
| Sum of Pesticides | 0 | 0 | 0 | 0 | 0 |

VOLATILES

| | | | | | |
|------------------------|----|---|-----|-----|----|
| Trichlorofluoromethane | 0 | 0 | 0 | 0 | 0 |
| 1,1-Dichloroethylene | 0 | 0 | 0 | 0 | 0 |
| Acetone | 10 | 4 | 43 | 210 | 41 |
| Methylene Chloride | 0 | 3 | 2.5 | 0 | 0 |

| | | | | |
|----|----|------|-------|----|
| 0 | 0 | 0 | 0 | 0 |
| 0 | 0 | 0 | 0 | 0 |
| 0 | 0 | 0 | 0 | 0 |
| 0 | 0 | 0 | 0 | 0 |
| 0 | 0 | 2 | 1 | 0 |
| 0 | 0 | 1.5 | 0 | 0 |
| 0 | 0 | 0 | 0 | 0 |
| 0 | 0 | 0 | 0 | 0 |
| 0 | 0 | 0 | 0 | 0 |
| 0 | 2 | 0 | 0 | 0 |
| 0 | 0 | 0 | 0 | 0 |
| 0 | 0 | 0 | 0 | 0 |
| 0 | 0 | 0 | 0 | 0 |
| 0 | 0 | 0 | 0 | 0 |
| 0 | 2 | 7 | 16 | 0 |
| 0 | 0 | 0 | 0 | 0 |
| 0 | 0 | 0 | 0 | 0 |
| 0 | 0 | 4.5 | 1.5 | 0 |
| 0 | 0 | 0 | 0 | 0 |
| 0 | 0 | 0 | 0 | 0 |
| 0 | 0 | 0 | 0 | 0 |
| 0 | 0 | 2 | 1 | 0 |
| 0 | 0 | 0 | 0 | 0 |
| 0 | 0 | 0 | 0 | 0 |
| 10 | 11 | 62.5 | 229.5 | 41 |
| 1 | 1 | 1 | 1 | 1 |

| | | | | |
|------|------|------|------|------|
| 6220 | 3480 | 890 | 1970 | 1120 |
| 3 | 3 | 3 | <1 | |
| 7.4 | 3.2 | 2 | 4.3 | 1.2 |
| 109 | 94 | 41 | 49 | 24 |
| <3 | <3 | 5 | 2 | <2 |
| <9 | 4 | 4 | <3 | <4 |
| 26 | 18 | 17 | 9 | 10 |
| 134 | 89 | 44 | 33 | 21 |
| 8740 | 5230 | 1440 | 2390 | 1290 |
| 170 | 120 | <30 | 40 | 50 |
| 4360 | 2310 | 3680 | 2440 | 1460 |
| 132 | 108 | 62 | 66 | 46 |
| 1 | 0.2 | 0.4 | 0.4 | 0.2 |
| 30 | 20 | <10 | <10 | <10 |
| <1.1 | <1.0 | <1.0 | <1.0 | <1.2 |
| 4 | <4 | 17 | <6 | <4 |
| <1 | <1 | <1 | <1 | |
| 690 | 228 | 143 | 119 | 97 |

OVERFLOW VOLUME COMPARISON WITH BASELINE CONDITIONS

As part of the Annual CSO Report, data is to be provided documenting the total frequency and volume of CSOs in the Metro system for the period June 1987 to May 1988. This information is then to be compared with the baseline condition to assess the effectiveness of CSO control projects employed to date. The principal source of both the volume and frequency data is Metro's CATAD system.

As noted in the section of this report on program implementation, the CATAD system is undergoing significant modifications to enhance both its control and monitoring capabilities. Work on hardware and software modifications began in earnest in 1987 and are anticipated to continue into 1989. As a result of this work, the original CATAD system has been decommissioned while the new system is being brought on-line. Data available from CATAD necessary to compile volume and frequency information by CSO site during the June 1987 to May 1988 is extremely incomplete and of questionable accuracy. We have not provided it in this report for that reason.

We anticipate similar problems in preparing our report next year covering the June 1988 to May 1989 period. Work on the new system should be complete by June 1989 and necessary data will be available for incorporation into subsequent reports.